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ABSTRACT

The high percentage of students not participating in or completing a science research project has been a recurring problem for science teachers. In this project, three variables influencing the problem are identified: (1) students' failure to engage in an active search for science research topics; (2) inadequate resource materials at the middle school level; and (3) students' failure to adequately research the topic prior to designing the experiment. Software was created for the Apple IIe computer that assisted students in their search for research topics. In addition, the software helped students conduct a literature search by offering research guidance. Finally, the software offered students specific examples of experimental designs in the areas of science that interested students. The targeted students spent two weeks using the software and an additional three weeks completing the science research projects. Student progress was observed and recorded and an attitude survey was administered before and after the completion of the science research adventure. It was concluded that this practicum increased student motivation and interest in the science research project and resulted in higher participation in all phases of the research. The document includes the purpose of the project, a brief literature review, a summary of the methods used, results, and recommendations. Appendices include a copy of the student attitude surveys, statistics, a student guide, a teacher guide, correspondence, and summary results. (CW)

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ED326402

USING CAI TO IMPROVE PARTICIPATION AND ACHIEVEMENT IN SCIENCE RESEARCH PROJECTS IN MIDDLE SCHOOL SCIENCE

by
SUZANNE M. PRINCE

A Practicum Report
submitted to the faculty of the Center for the Advancement of Education of Nova University in partial fulfillment of the requirements for the degree of Master of Science.

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Signed: Suzanne M Prince

NOVA UNIVERSITY
CENTER FOR THE ADVANCEMENT OF EDUCATION
3301 College Avenue
Fort Lauderdale, FL 33314

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Practicum Title: USING CAI TO IMPROVE PARTICIPATION AND ACHIEVEMENT IN SCIENCE RESEARCH PROJECTS IN MIDDLE SCHOOL SCIENCE

Student's Name: Suzanne M. Prince

Program Site: Dunbar Middle School Date: 5/25/89

Observer's Name: Charles F. Ball, Jr. Charles F. Ball, Jr.
(please print---------and sign)

Observer's position: Principal Phone # 813-334-1357

Observer's comment on impact of the project (handwritten): The project created a situation where student actively participated in the learning process. The increased involvement generated a very effective learning experience and a greater quantity and quality of science fair projects.

iv

ABSTRACT

Using CAI To Improve Participation and Achievement in Science Research Projects in Middle School.
Prince, Suzanne M., 1989: Practicum Report, Nova University, Center for the Advancement of Education.
Descriptors: Science Education/Science Instruction/Science Education Research/Secondary School Science/Science Fair/ Process Skills/Microcomputers/Computer Assisted Instruction/ Computer Managed Instruction/

The high percentage of students not participating in or completing a science research project has been a recurring problem for the researcher. The researcher identified three variables influencing the problem: (1) students' failure to engage in an active search for science research topics, (2) inadequate resource materials at a middle school level, and (3) students' failure to adequately research the topic prior to designing the experiment.

The researcher created software for the Apple IIe computer that assisted students in their search for research topics. In addition, the software helped students conduct a literature search by offering research guidance. Finally, the software offered students specific examples of experimental designs in the areas of science that interested the students.

The targeted students spent two weeks using the software and an additional three weeks completing the science research projects. Student progress was observed and recorded and an attitude survey was administered before and after the completion of the science research adventure.

This practicum increased student motivation and interest in the science research project and resulted in higher participation in all phases of the research.

Table of Contents

Page

Title Page..... i

Authorship Statement..... ii

Abstract..... iii

Observer's Verification..... iv

Chapters

I. Purpose..... 1

II. Research & Solution Strategy..... 12

III. Methodology..... 26

IV. Results..... 33

V. Recommendations..... 38

Reference List..... 40

Bibliography..... 43

Appendices..... 45

Appendix A: A Survey of Student Attitudes About Science Research Projects..... 46

Appendix B: Summary Results To a Survey of Student Attitudes About Science Research Projects..... 49

Appendix C: Statistics of Student Performance on Science Research Projects from 1983-88..... 51

Appendix D: Student Guide To Science Research Adventure..... 53

Appendix E: Teacher Guide To Science Research Adventure..... 62

Appendix F: Permission Letter To Parents..... 69

Appendix G: A Survey of Student Attitudes Toward CAI..... 71

Appendix H: Progress Letter To Parents..... 74

Appendix I: Summary Results To CAI Survey Before Starting Science Research Projects..... 76

Appendix J: Summary Results To CAI Survey After Completing Science Research Projects..... 78

CHAPTER I

Purpose

Background

The practicum setting is a racially mixed middle school in a school district of approximately 36,000 students. The school had its beginnings in 1963 when it was built as a new facility to replace the only all-Black high school. It remained as a high school until all county schools were integrated in 1967. It then became one of two holding schools for all seventh graders in the county and later a middle school. Presently, the total school enrollment stands at 401 students in grades six through eight. The student population served has decreased steadily during the past five years. In 1982, the student enrollment was 524. The reduction in population is due to the lack of growth within the school's boundaries.

The students are distributed in the following grades: 131 sixth graders, 136 seventh graders, and 134 eighth graders. The school's minority population is 43 percent. This is the highest minority

population in any of the district's schools. The boundaries of the school are widespread. Students are bused from the southern, eastern, and central portions of the county. Sixth grade students enter from eleven feeder elementary schools.

The majority of the student population comes from low income families. Sixty-two percent of the students receive free or reduced lunch. Only 32 percent of the students live with both of their natural parents. Thirty-eight percent of the student body reside with their natural mother only. Blended families make up 18 percent of the student population. Death, divorce, separation, or desertion affect nearly 41 percent of the students and their families. Parental involvement in the children's education is minimal. In the past three years, the school has been unable to involve more than three families in participation in the Parent Advisory Committee. Attempts have been made to schedule meetings during lunch hours and preceding extra-curricular activities.

Currently, there are 26 full-time faculty members and three part-time members. Four of the full-time staff make up the exceptional student education program. Included in the professional staff are one

guidance counselor, one compensatory education teacher, one Chapter I reading specialist, and one media specialist. The para-professional staff includes one library aide, one clinic aide, two exceptional student program aides, one Chapter I aide, and one half-time compensatory education aide. The school also is served weekly by a school nurse, a school social worker, a speech and hearing therapist, a school psychologist, a city police resource officer, and an occupational specialist. The principal and the assistant principal comprise the administrative staff.

The school hours for faculty and staff are from 8:10 A.M. to 3:40 P.M. The students begin at 9:15 A.M. and end at 3:30 P.M.. Students attend seven classes daily which are 42 minutes in length. Students and teachers have a 25 minute lunch period. Each teacher has a 42 minute planning period during the day. There is also a 40 minute planning period before students arrive. This time is mainly taken up with parent conferences, faculty meetings, team meetings, and department meetings.

The researcher is a general science teacher with 18 years of teaching experience. Twelve of these years have been spent at this middle school. The

researcher holds a Bachelor of Arts in English Education from a state university. Additional science courses were taken in order for the researcher to add middle school and junior high science to the researcher's teaching certificate. After teaching language arts and reading for 14 years, the researcher began teaching science in 1984.

The researcher teaches five sixth grade general science classes and one seventh and eighth grade science research class. The teaching day is divided into seven 42 minute class periods. In addition to the preschool conference time, the researcher has one of the periods available daily for planning. This time is spent grading student work, planning daily lessons, and preparing for laboratory experiences. The researcher also spends three mornings of each week working with students involved in a Young Technologist's Club. This club meets during the preschool conference time of the researcher.

Problem Statement

The teaching of science usually involves engaging students in science research projects. There are several good reasons for encouraging such projects. It is a scientific process that blends the skills and content learned in the classroom with the interests of the students. Society has a need for citizens who possess technological and critical thinking skills (Goldberg,1980). In the Survey of Student Attitudes About Science Research Projects (see Appendix A:46 and B:49) administered to the 1988-89 seventh graders, 67 percent of the students felt that science research projects are worthwhile.

This middle school has made science research projects one of the highest-priority goals for the past five years. This goal has involved all of the disciplines working together to insure successful research projects. The language arts department has helped students conduct library research and write research papers. The mathematics department has instructed students in the uses of graphs and numerical data. The media specialist has taught researching techniques to language arts and social studies classes using science problems. The art

department has instructed students in lettering and design so that backboards are well made. Even the industrial arts and physical education classes have been involved. Shop classes cut backboards and physical education classes have served as subjects of research. Even with such school-wide emphasis on these science research projects, the researcher has observed that many students do not become involved in this invitation to learn. Eighty-five percent of the students should be completing a science research project. Analysis of this researcher's records over a five year period revealed some helpful information. This information has been summarized in Appendix C:51. Examination of the data reveals that only 65 percent of the students in the sixth grade completed a science research project. Further analysis showed that 78 percent of the sixth graders started a project. Furthermore, only 56 percent of the students actually began a research project and brought it to completion. Although the percentages are not the same, it has been the observation of the seventh and eighth grade science teachers that the same problem exists at their levels also.

The problem of poor participation in interdisciplinary science research projects has persisted throughout the years. The researcher reviewed the literature for possible causes of the problem and could not locate any specific mention of it. However, all literature about science research projects and process skills indicate the importance of such work.

The researcher identified several possible variables that might influence this problem. The first is student failure to engage in an active search for science research topics. Students often lack motivation to complete assignments or projects of long duration. With 41 percent of the students' home life affected by poverty, death, desertion, separation, or divorce, students receive very little motivation to succeed. On the Survey of Student Attitudes About Science Projects (see Appendix A :46 and B:49), 49 percent of the students responding felt that it was difficult to work on school projects at home because of television, brothers and sisters, or family problems. Only 52 percent of the students responded on the survey that they enjoyed doing science research projects.

The second variable identified by the researcher as a possible factor in the students' poor participation is inadequate resource materials at the middle school level to help students make wise choices for research topics. This includes resource people as well as written resource material. Seventy-three percent of the students surveyed about science research projects believed they would enjoy doing science research projects if more individualized help was given in the area of choosing a topic and designing an experiment.

During the initial phase of guiding students in research topic selections, the researcher had the assistance of the media specialist. At any one time, only 2-4 students were able to be helped one-on-one in the selection of topics. Other students were left to search alone until it was their turn. Behavior problems occurred at such times and student involvement in the task declined steadily as they awaited their turn. Sixty-four percent of students surveyed felt they were in need of more help in finding research topics. Another 66 percent of the students identified a need for additional written

information that they could understand explaining how to do science research projects.

A third variable identified by the researcher was student failure to adequately research the topic prior to beginning the actual experimentation. Without such complete research, students are unable to hypothesize or plan an experiment complete with materials and procedures necessary to test a hypothesis. When students were surveyed about their ability to design an experiment complete with hypothesis, materials list, and procedures, 77 percent felt that they could not do so without help.

This researcher recognized that the students needed additional tools to provide the skills, motivation, and encouragement necessary for the successful completion of science research projects. These tools would provide a means for students to search for meaningful topics, to direct students in library research of the chosen topic, and to guide them in setting up appropriate experimental designs.

Outcome Objectives

This researcher presented the following outcome objectives:

(1) Upon completion of the Science Research Adventure software program, 90 percent of the students in the target group will have identified a science research topic of interest to them, as measured by a tally kept in the teacher's gradebook.

(2) During the implementation of the Science Research Adventure, the number of students actively involved in searching for science research topics will increase 30 percent as measured by teacher observations of on-task behavior and discipline records.

(3) After completion of the Science Research Adventure, 90 percent of the students in the target group will demonstrate a more positive attitude toward science research projects as measured by a pre and post survey.

(4) Upon completion of Science Research Adventure, 90 percent of the students in the target group will submit a science research plan that includes a well designed experiment with materials and procedures necessary to test a hypothesis.

(5) Upon completion of the Science Research Adventure, 90 percent of the students in the target group will show increased motivation as measured by the percentage of students bringing projects to completion as compared to previous years' percentages.

CHAPTER II

Research and Solution Strategy

The researcher conducted an extensive review of the literature and discovered very few studies existed solely about science research projects, while much was written about science fairs and the mechanics involved in conducting them. Process skills have been closely identified with the science curriculum and are an important aspect of the science research project. The researcher discovered more studies on the importance of process skills to the science curriculum and how they enable a student to learn through discovery.

To understand the importance of the science research project one has to understand the nature of science education and learning. One of the primary goals of science education has always been the teaching of problem-solving skills. But in actuality, students have received 13 years of preparation for problem-solving instead of actual practice. Laws, rules, classifications, and schemes are all studied in preparation for the aquisition of problem-solving skills. Few students actually solve real problems.

They reconfirm previous knowledge. Students may never investigate real questions or test new ideas (Yager, 1988).

Preparing students for their role in today's technology can be accomplished through science research projects (Padilla, 1986). A science research project can be defined as the manipulation of variables and the collection of data needed to solve a problem. It gives students opportunities to conduct experiments that involve collecting data over a long period of time and analyzing data for the effect of the variables (Chiappetta, 1984). Students must be guided in the asking of the right questions and encouraged in the conducting of investigations capable of answering these questions.

Goldberg (1980) stated that a positive climate was necessary for effective scientific learning. This positive climate would permit students to ask questions and hypothesize possible answers while learning the scientific process. Yager (1984) reported on what students thought about science teaching and teachers. He analyzed the results of the 1978 and 1983 assessments in science by the National Assessment of Educational Progress. Nine thousand students in

the 13 year old and 17 year old groups were surveyed. Both groups of students valued the study of science and felt it was useful. However, they felt they had little input into topics or due dates. The 13 year olds felt that they were able to work at their own rate in science. The science research project offers students opportunities to investigate topics of interest to them and at a pace they set.

The science research project also provides an opportunity to apply problem-solving skills to content not covered in the classroom (Shaw, 1983). In a review of three research projects designed to determine the status of science education in the United States, Yager (Yager and Penick, 1983) reported that 90 percent of the schools did not offer the type of science desired by the students. It also revealed that 98 percent of science teachers have set goals leading toward more formal study of science. Yet only 17 percent of students graduating from high school ever graduate from college (Leyden, 1984).

Students' experiences in science are established by the use of textbooks in 90 percent of the schools. The teaching of science research projects can fill a void that exists in these schools. Everyone is looking

for solutions to scientific illiteracy and one way to permit students to see real science is to apply science to everyday life. This can be handled through a properly planned science research project (Leyden, 1984).

Process skills are identified by the Commission on Science Education of the American Association for the Advancement of Science (AAAS) as skills necessary to solve problems. They are divided into two groups: basic and integrated. The basic process skills are observing, inferring, predicting, classifying, and collecting and recording data. The integrated process skills are interpreting data, controlling variables, hypothesizing, and experimenting (Shaw, 1983). According to Shaw, the "back to basics" movement has resulted in less teaching of these process skills. The lab approach in the classroom is not adequate to teach all of these and, in fact, offers only activities that verify the questions and explanations developed by others (Yager, 1988). The science research project offers to sharpen students' process skills beyond the classroom and in a way that relates science to the students' world.

Green (1982) stated that one of the basic goals of science education is mastery of the inquiry processes. Green maintains that students can learn these processes by participating in them actively in the science program. Four studies investigated the relationship between process skills, problem-solving, and science achievement. Schneider and Renner (1980) involved 48 students in a study to compare concrete and formal teaching. Twenty-three students in the inquiry group were taught science concepts using an inquiry instructional approach. The other 25 students were in the exposition group and were taught the same science concepts. The study lasted 12 weeks and the concepts taught were concrete operational. They concluded that it was necessary for the learners to have hands-on experiences in order to understand the science concepts. One of the ways Piaget decided if someone was a concrete or formal learner was to ask that person to design an experiment to solve a problem.

Renner, Grant, and Sutherland (1978) also investigated this relationship between science content and concrete thought. They involved 588 Oklahoma students in grades 7 through 12. Students were given

6 tasks to show in what stage of Piaget's logical operations they functioned. The majority of them thought at the concrete operational level. They suggested that if these learners are given concrete experiences with objects, events and situations, then they will learn about them and gain experience.

Saunders and Shepardson (1987) reported on an investigation into the relationship between concrete and formal science instruction and science achievement. Sixth grade science students were divided into two groups with one group receiving formal instruction and the other group receiving concrete instruction. Those students in the formal group were given lectures, discussions, oral quizzes, written assignments, readings, and films. The students in the concrete group had activities organized around a learning cycle approach that involved them in observing, measuring, experimenting, interpreting, and predicting activities. The results indicated a higher level of science achievement and cognitive development among the concrete learners. They concluded that there was a link between science achievement and hands-on science instruction.

An investigation by Wideen (1975) involved third through sixth graders in a study to determine if the process approach and the traditional approach differed. This study evaluated the Science Curriculum Improvement Study (SCIS) and Science A Process Approach (SAPA) as it compared with the traditional science program. Wideen concluded that students in the SCIS and SAPA programs had improved process skills and that these skills were retained for future use. All of these studies would indicate that a science research project is an excellent way to extend the teaching of process skills beyond the confines of the science classroom.

Support for the assigning of science research projects can be found throughout the literature (Chiappetta, 1984). Reading skills can be enhanced through the fact-gathering and interpretation of data. Students' scientific literacy is increased. An inquiry approach to science aids in language development as students learn to share and communicate their procedures and results. Writing skills are enhanced as students learn the value of written communication in science research projects. Lastly, science research projects reinforce the content and

process skills taught in the science program while encouraging students to pursue their own interests.

Iritz (1987) indicated that choosing a science research topic is the most difficult part of the entire project. It is suggested that students look at magazines, newspapers, and television programs as possible sources of ideas. Further ideas may be found by noticing the problems of students, and current and local issues. Thus, it is advised that the students be aware of their environment. For the disadvantaged students taught in this practicum setting, this is an impossibility.

Texley (1984) maintains that even for high school students the choosing of a research topic is the most critical aspect and is beyond the reach of students without guidance and training. Topic ideas can be taught the same way as the teaching of process skills. Texley maintains a clipping file of hypotheses and abstracts gathered from journals, magazines, and newspapers. These are shared with students in discussions that expand on the topics. This researcher also has kept a file of topic ideas and students showed much interest in these file cards. Many new project ideas have been generated from these.

The researcher believes that the file of topics is so successful because the ideas are understandable and appealing to the middle school level student. This file of topic ideas led this researcher to think of putting such ideas into a computer program that would permit more students access to such topics.

Bombaugh (1987) advises having brag books showing past ideas and letting older students share ideas with younger ones. The researcher has used a slide show of photographs picturing past students and their projects in place of brag books. This has had limited success. However, it has been very useful in helping 6th grade students understand the nature of a research project and the role of the backboard in the display. But often the results have been projects that were duplicates of those shown.

Teachworth (1987) relates that students of all ability levels have difficulty in choosing topics, setting up experiments and procedures, and drawing conclusions. He advises using cooperative parents in helping students with poor writing skills and underdeveloped process skills. This is not a feasible alternative in this practicum setting when so little help is available in the home and many of the parents

have limited educational experiences with science research projects. Glass (1984) describes how the Iowa Academy of Sciences backs it researchers. Workshops on how to find topics worthy of investigation are given by teachers and previously successful science research students. Help is given in locating resources and presenting findings. This researcher has offered that kind of help in this practicum setting. A Young Technologist's Club has been organized and meets three mornings before school. Its main purpose is to help students identify problems to be solved and offer students the help and facilities needed to complete such studies. Many of the alternatives proposed by others have been tried by this researcher with varied success. Students are given hands-on experiences in the science classroom with controlled experiments. These experiments are written up using the same format of the science research project as suggested by Bombaugh (1987).

Padilla and Padilla (1986) estimate that there are one million microcomputers in elementary and secondary schools. It is suggested that such learning tools as the microcomputers be used to master the science process skills. One variable that influences

such learning is time on task (Tobin, 1986). Improving mastery and achievement is not done just by allowing time for task completion but also by engaging the student in the task. Benjamin Bloom defines engagement as responding in a relevent manner. Rossman (1983) criticized science education techniques that simply taught a body of knowledge. Such techniques failed to engage the students in learning and was seen as causing students frustration and leading them to lose interest. The discovery method was seen as a way to re-engage students in the pursuit of science. The use of microcomputers in the science classroom can control the variables of time on task and student engagement. The use of the computer is known to increase the attention span of students and provide students with more motivation.

Ngalyaye and VanderPloge (1986) studied the effects of computer-assisted .nstruction (CAI) on achievement of educationally disadvantaged students in second through eighth grades and concluded that supplementary CAI was more effective than non-supplementary CAI for these students. Ascher (1985) also studied disadvantaged students and found that Black students perform best when common knowledge

or daily experiences were involved. They did poorly if a detached research attitude was necessary toward the object or phenomena of science. It was also concluded that minority and economically disadvantaged students are the ones most affected by such classroom factors as too little time spent on instruction or too much time spent in handling disciplinary problems.

Microcomputers used to engage students in science research projects would help alleviate such problems. A software program that engaged students in the task of identifying a research topic would likely increase time on task and reduce behavior problems caused by unengaged students. By offering a variety of topics for consideration, the minority students could identify a research topic that relates more to their everyday life. Written materials today offer few relevant topics and even less topics that are ideal for the middle school student.

Lai (1984) evaluated an 80 hour course that integrated computers into the math and science curriculum in grades 6 through 12. Data was collected from 370 students, 13 instructors and included 40 hours of observations. The results from such a study revealed that there were gains in computer programming

skills, math problem-solving, and attitudes toward computers. Edwards (1985) also discovered the value of computer-based instruction in teaching generalizations. A corrective feedback paradigm was used to introduce concepts and reintroduce missed items in a particular sequence. The systematic review of these items helped the subjects to remember the concepts over time better. It was concluded that computer-based drills provide adaptive instruction because concepts are reviewed contingent on the individual's performance. The microcomputer also offers students control over the pace of their learning. A study involving 1022 seventh grade students in ISCS in 43 Indiana classrooms revealed learning rates are influenced by pacing (Gabel and Herron, 1977). The students were divided and exposed to various groupings, pacings, and instructional methods consistent with such stategies. Students learned more effectively when allowed to establish their own learning pace. This study was not done with microcomputers but could be applied to their use in the classroom where students set their own pace on the computer.

After a search of the literature showing sound reasons for offering students an opportunity to research a topic in science, computer-assisted instruction appeared to offer the best solution. Although there was not one solution dealing specifically with topic selection or designing experiments, the literature pointed to the importance of learning process skills to solve problems (Shaw, 1983). Much research emphasized the strong relationship between process skills and science achievement (Saunders and Shepardson, 1987). The researcher proposed to solve the problem of poor participation and completion of science research projects by implementing CAI that will aid students in topic selection, research guidelines, and experimental designs.

CHAPTER III

Methodology

The first step in the implementation of this practicum was to inform the principal at the practicum site of this proposal and secure permission to implement it. Following this, the researcher designed computer software for the Apple IIe that would accomplish the following three objectives:

(1) Provide students with a wide range of science research topics in life, physical, earth, and computer sciences,

(2) Identify for students references enabling them to search the literature in the area of their chosen topics,

(3) Review for students the format for designing an experiment and offering specific examples in the different categories of science.

The researcher also provided documentation of the software in the form of a student guide and a teacher guide (see Appendix D: 53 and Appendix E: 62). The

researcher expected that it would require one month to complete the first two steps. It actually required three months to design the software.

The third major step for the researcher involved identifying those students who would participate in the practicum. The targeted students were 26 members of one particular sixth grade science class taught by the researcher. With students withdrawing and and new students entering, the target group had a final number of 23 participating students. This heterogeneously grouped class had a minority ratio similar to the school's population. The class met each day for 45 minutes. A letter was sent home advising the students' parents of the practicum and securing their permission for the students' participation (see Appendix F:69).

In order for the researcher to assess the impact of the software on the student's attitude and achievement, an attitude survey was administered before and after completion of the software package (see Appendix G:71). This was the fourth step and was also used at a later stage. One strategy used by others was involving parents in the research project. To improve the poor parent/school involvement that

existed at the practicum site, this researcher composed a series of letters. The letters were sent to the parents as students completed the various stages of the research project. These letters kept the parents apprised of the students' progress and also served to acknowledge the students' performance in a positive manner (see Appendix H:74). Choosing the target group, securing parental permission, and surveying the target students involved no more than five school days.

Before the targeted students began using the software, it was necessary for the researcher to reserve time in the school's Apple IIe computer lab. This lab has 16 Apple computers and is available to all classes. Due to the size of the target group, only half of the group could work on the computers at one time. It was not feasible for two students to share the computer as was normally the case. Arrangements were made for the other half of the class to work elsewhere on an alternate assignment.

The media specialist provided the alternate site and assignment. It was decided that the students would benefit from a review of the media center's references with lessons on how to use these

references. A schedule was created that allowed one half of the target group to spend time in the media center and the other half of the target group to spend time in the computer lab.

This plan actually resulted in shortening the overall completion time of the science research projects. The actual time needed by the students to complete the software varied according to each student's progress through the software. One of the strategies identified in the research suggested that students be permitted to set their own learning pace. The software provided students with an opportunity to continually review sections as needed. The researcher estimated that three weeks would be needed for the completion of the software but because of the media center arrangement, the software was used for only two weeks.

Two middle school science teachers and a high school computer science teacher reviewed the software prior to student use. Punctuation, spelling and grammatical errors were corrected at that time. Additional suggestions for improvement of the software were considered and implemented.

The researcher introduced the details of the science research adventure project in one class period. All members of the target group were present. The software was introduced to the target group the following day. Booklets were handed out to the students that would serve as notebooks (see Attachments). Topic, hypothesis, library research, materials and procedures, data and observations, graphs, and conclusions were to be recorded in the booklets. A science research project would be complete when this notebook included all of the above mentioned items.

A student guide was used to instruct the students in the use of the operating system disk and the program disk. Most of the students were already familiar with the Apple IIe computers and terms, operating system disk and program disk. The few new students to the class received additional instruction while the others began working with the software. It was at this time the target group was divided and began the media center activities.

The reseacher monitored the students' activities and assisted those that encountered difficulties. The students were encouraged to offer suggestions on the

improvement of the software. A few errors in punctuation, grammar and spelling were found. Of particular interest to the researcher was the reading level of the vocabulary used in the software. If students encountered difficulty with any of the vocabulary, it was noted. Later, these vocabulary words were examined to determine their appropriateness. After the students had completed the software, these vocabulary words were either deleted and better words substituted or explanations of the words were added.

The researcher kept an index card on file for each of the students in the target group. Information on the card was gathered during observations of the students working with the software and through student interviews. Each index card identified the topic choice of the student, difficulties encountered with topic and software, and the progress the student made in the stages of the project. This data was then used in individualizing the progress report sent home to each student's parents.

After completion of the software (and media center lessons), the target group resumed meeting in the classroom for the completion of the

experimentation portion of the reseach project. Students were permitted to work individually and at their own pace on the experiments. They made use of fellow students as volunteers in some of the experimentation. They used class time to complete the written portion of the research project and had access to the researcher when questions arose concerning experimentation, data, or conclusions.

One Apple IIe computer was available in the classroom if students needed to review information given in the software. As students completed their projects, they offered advice and assistance to other students which proved quite welcome and helpful. The students were very curious about the outcomes of projects in which they had participated. Each of the students in the target group had an opportunity to explain to the class the purpose of the project and the results obtained. The attitude survey was administered to the target group for a second time.

CHAPTER IV

Results

Several different methods were used to evaluate the effectiveness of this program. The first objective stated that 90 percent of the students would identify a topic of interest to them. Data for this objective came from records kept on index cards. Each student's chosen topic was recorded on an index card along with the steps completed and difficulties encountered. These cards were updated by daily interviews with the students. One hundred percent of the 23 students were able to identify a science research topic using the software. The students either chose a topic of interest to them from the software or the software stimulated their creativity and helped them to think of an original topic or to adapt a topic suggested by the software.

In the second objective, the number of students expected to become actively involved in searching for a science research topic would increase 30 percent as measured by observations of on-task behavior and discipline records. The improvement in behavior was

noteworthy. The target group was divided into two groups with one group at a time working in the computer lab and the other group working in the media center. The media specialist used the assertive discipline plan to record checkmarks for student misbehavior. The same discipline plan was used in the computer lab. No discipline check marks were recorded while students searched for their topics using the computer software. But when students were involved in reviewing research skills in the media center, misbehavior and off-task behavior did result in discipline checkmarks being recorded. The number of checkmarks were equivalent to those accumulated by other science classes and was not unusual.

The fact that none were accumulated in the computer lab was significant. As students examined the software's suggested topics, they noted the topic that interested them and continued through the software. If they needed help in understanding a topic, they raised their hand. There was little talking, no horseplay or off-task behavior exhibited. It had been the researcher's previous experience that this phase of the science research project caused the most misbehavior. This phase usually took place in

the media center where there were few books or materials directly offering science research project topics. Often, students had to share books and engaged in unrelated conversations and off-task behaviors at a time when it was necessary for the researcher to work individually with a student. This was evident again with half of the target group meeting in the media center for research skills. They earned discipline checkmarks while the other half of the target group using the software was totally engaged in the topic search and were more successful in deciding on a science research topic.

The third objective was measured by using a pre and post survey on computer assisted instruction. Ninety percent of the students were expected to demonstrate a more positive attitude toward science research. Although the percentages actually recorded by the pre and post surveys did not reflect the expected 90 percent, they were significant (see Appendix I:76 and Appendix J:78). The students were asked to consider the way they had done science research projects in the past with the CAI process used in this project. Only 4 percent of the students felt that they did not do their best work when using a

computer. None of the students wanted to use a textbook in place of a computer for the science research project. Seventy-eight percent liked being able to work at their own speed with the computer. The pre survey indicated only 56 percent of the students enjoyed computers and learned better when they used them with 36 percent unsure of this. The post survey demonstrated that 70 percent now enjoyed computers and only 22 percent were unsure.

The fourth objective stated that 90 percent of the students will submit a science research plan that included a well designed experiment with materials and procedures. This objective was measured by means of the index cards kept on the students' progress. Twenty one students or 91 percent of the target group submitted a well designed science research plan.

The final objective called for 90 percent of the target group to show increased motivation as evidenced by the completion of a science research project. The index cards were again used to attain this data. The students also submitted their written project booklets. These booklets contained the student's chosen topic, library research, hypothesis, materials and procedures lists, data and observations, graphs,

and conclusions. Eighty-seven percent of the students showed increased motivation by bringing their science research projects to completion. Although this was not the anticipated 90 percent, the researcher was quite satisfied with the results. In past years, this researcher has had an average of only 78 percent of the students actually starting research projects.

To start a project, a student must be successful in choosing a topic. After using this software, 100 percent of the target students were able to start a science research project. The highest percentage of students completing the science research project in the past had been 75 percent and the average completion rate was only 65 percent. So a completion rate of 87 percent represented a dramatic change in the motivation of the students.

In conclusion, this project demonstrated that student motivation and interest in the science research project can be increased through the use of CAI. Furthermore, CAI can also increase the participation in all phases of the science research project in addition to topic selection.

CHAPTER V

Recommendations

Since this computer software did increase the motivation and participation of students involved in science research projects, it will be made available to other classes of students at the middle school. Several other science teachers have expressed an interest in using the software, and have suggested areas in which the software can be expanded to meet additional needs. The researcher plans to continue to update the software with new project ideas. There is enough flexibility in the software to modify it further.

This software only leads students through three stages of the science research project and there is a need for additional help at other stages. Students need more assistance in researching the topic beyond what this software offers. The researcher would like to expand the software at a later date to also include such areas as: data analysis, data graphing, abstract writing, and drawing conclusions. The

software could always be further enhanced by adding additional graphics.

Once the software has been improved and modified, the researcher will share it with others on a broader scale. The researcher has been unable to locate commercial software that serves the same purpose and many science teachers have encountered the same problems the researcher reports. After further modifications and improvements, the software will be shared with other teachers in the county who have a need for it and results will be shared with the Teacher Education Center. The results could be shared with a national audience through a manuscript submitted to a national science journal. It is also the desire of the researcher to attend a national science conference at which time the practicum results could be presented.

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APPENDICES

APPENDIX A

A SURVEY OF STUDENT ATTITUDES ABOUT SCIENCE RESEARCH PROJECTS

APPENDIX A

A SURVEY OF STUDENT ATTITUDES ABOUT SCIENCE RESEARCH PROJECTS

DIRECTIONS: Circle TRUE or FALSE to each question below. Please answer honestly. You do not have to put your name on this survey!

T F 1. I enjoy doing science research projects.

T F 2. My parents encourage me to complete school projects.

T F 3. The easiest part of a science research project is choosing a topic that interests me.

T F 4. I was able to start and complete my science research project on time.

T F 5. I did most of the work for my science research project at home.

T F 6. Science research projects are just too hard for me.

T F 7. There are many books and materials about science research projects that I'm able to read and understand.

T F 8. My parents helped me the most in finding a science research project.

T F 9. My teacher was able to give me as much help as I needed to find a topic for my science research project.

T F 10. I was able to do most of my science research project at home.

T F 11. I needed more help in finding a science research topic.

T F 12. My teacher helped me the most in finding a science research topic.

T F 13. I have a place in my home where I can study or work on special school projects.

T F 14. I found a science research topic without help from my teacher or parents.

T F 15. I could design an experiment complete with hypothesis, materials list, and procedures without help.

T F 16. I would enjoy doing science research projects more if I was given more individualized help in choosing a topic and designing an experiment.

T F 17. It is hard to work on school projects a home because of TV, brothers and sisters, or family problems.

T F 18. I think science research projects are worth doing because I learn a lot from them.

T F 19. It is easy to start a science research project but hard to finish one.

T F 20. It would be helpful if there was more written information on how to do science research projects that I could understand.

APPENDIX B

SUMMARY RESULTS TO A SURVEY OF STUDENT ATTITUDES ABOUT SCIENCE RESEARCH PROJECTS

APPENDIX B

SUMMARY RESULTS TO A SURVEY OF STUDENT ATTITUDES ABOUT SCIENCE RESEARCH PROJECTS

The results are given in percentages.

	TRUE	FALSE
1.	52	48
2.	95	5
3.	54	46
4.	62	38
5.	52	48
6.	19	81
7.	76	24
8.	21	79
9.	64	36
10.	58	42
11.	36	64
12.	46	54
13.	69	31
14.	35	65
15.	23	77
16.	73	27
17.	49	51
18.	67	33
19.	43	57
20.	66	34

APPENDIX C

STATISTICS OF STUDENT PERFORMANCE ON SCIENCE RESEARCH PROJECTS FROM 1983-1988

APPENDIX C

STATISTICS OF STUDENT PERFORMANCE ON SCIENCE RESEARCH PROJECTS FROM 1983-1988

YEAR	TOTAL NUMBER OF STUDENTS	NUMBER WHO STARTED PROJECTS	NUMBER STARTED AND FINISHED	TOTAL NUMBER OF PROJECTS
83-84	135	96	64	80
84-85	120	82	54	72
85-86	104	91	72	78
86-87	70	66	42	44
87-88	120	91	73	84

YEAR	TOTAL NUMBER OF STUDENTS	PERCENT WHO STARTED PROJECTS	% WHO STARTED AND FINISHED	TOTAL % OF PROJECTS FINISHED
83-84	135	71	47	59
84-85	120	68	45	60
85-86	104	88	69	75
86-87	70	94	60	63
87-88	120	76	61	70
TOTAL	549	78	56	65

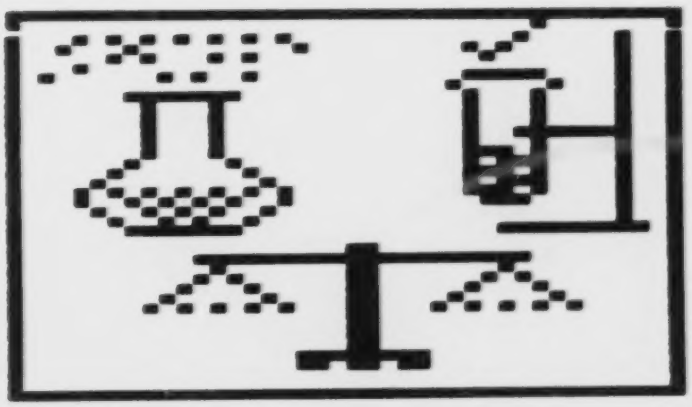
APPENDIX D

A SCIENCE RESEARCH ADVENTURE STUDENT GUIDE

APPENDIX D

A SCIENCE RESEARCH ADVENTURE

STUDENT GUIDE

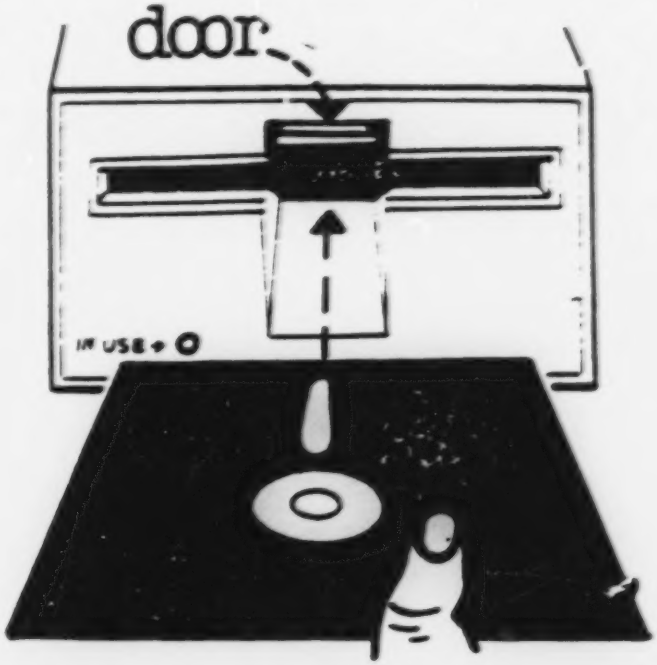


SUZANNE M. PRINCE
NOVA UNIVERSITY
APRIL-MAY 1989

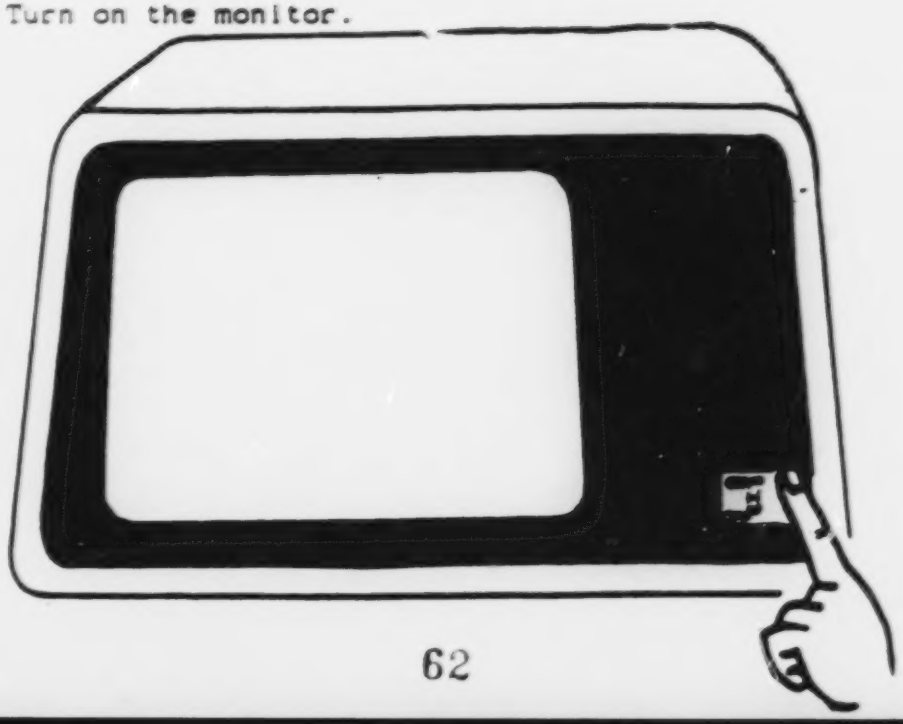
YOU ARE READY TO LEARN HOW TO USE <u>THE SCIENCE RESEARCH ADVENTURE</u> SOFTWARE.

1. Before turning the computer on, remove the disk from its protective cover. Turn the disk over to the side without the label (the backside). This side of the disk contains the operating system and is called the SYSTEM DISK.

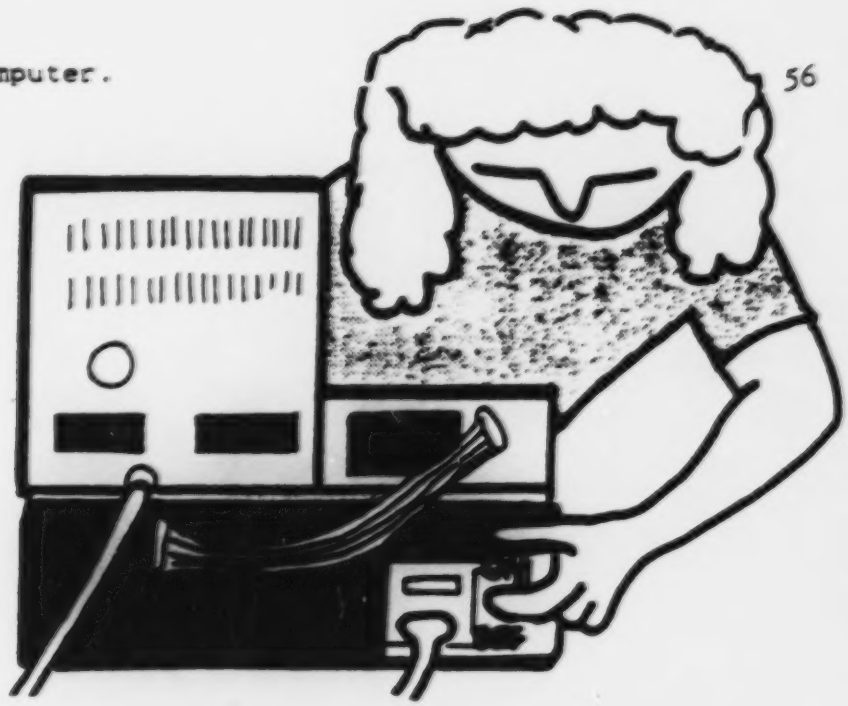
2. Insert this backside of the disk into the disk drive and close the door.



3. Turn on the monitor.



4. Turn on the computer.



5. You will see the following screen appear:

```
****************************************
*                                      *
*          PRODOS USER'S DISK          *
*                                      *
* COPYRIGHT APPLE COMPUTER, INC. 1983  *
*                                      *
****************************************

YOUR OPTIONS ARE:

     ? - TUTOR: PRODOS EXPLANATION

     F - PRODOS FILER (UTILITIES)

     C - DOS <-> PRODOS CONVERSION

     S - DISPLAY SLOT ASSIGNMENTS

     T - DISPLAY/SET TIME

     B - APPLESOFT BASIC

PLEASE SELECT ONE OF THE ABOVE
```

6. Select <B> - APPLESOFT BASIC.

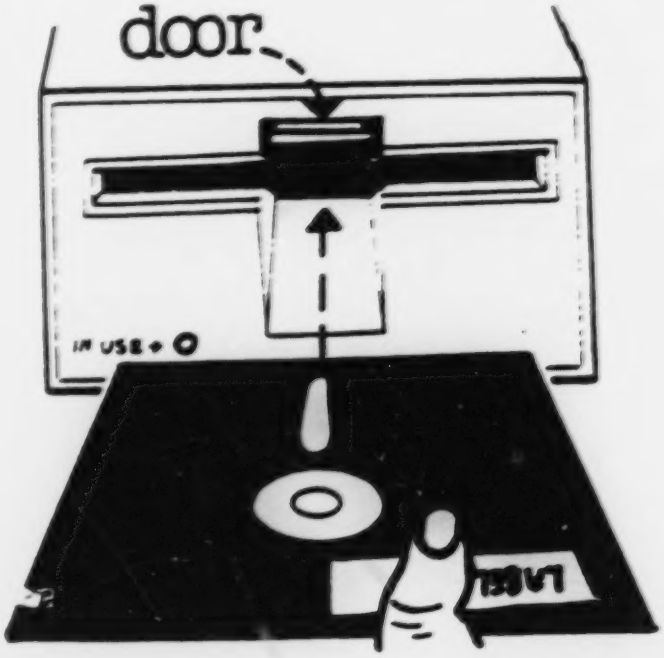
7. You will see the following screen:


```
TO RETURN TO MENU. TYPE

'RUN STARTUP'

AND PRESS RETURN.
```

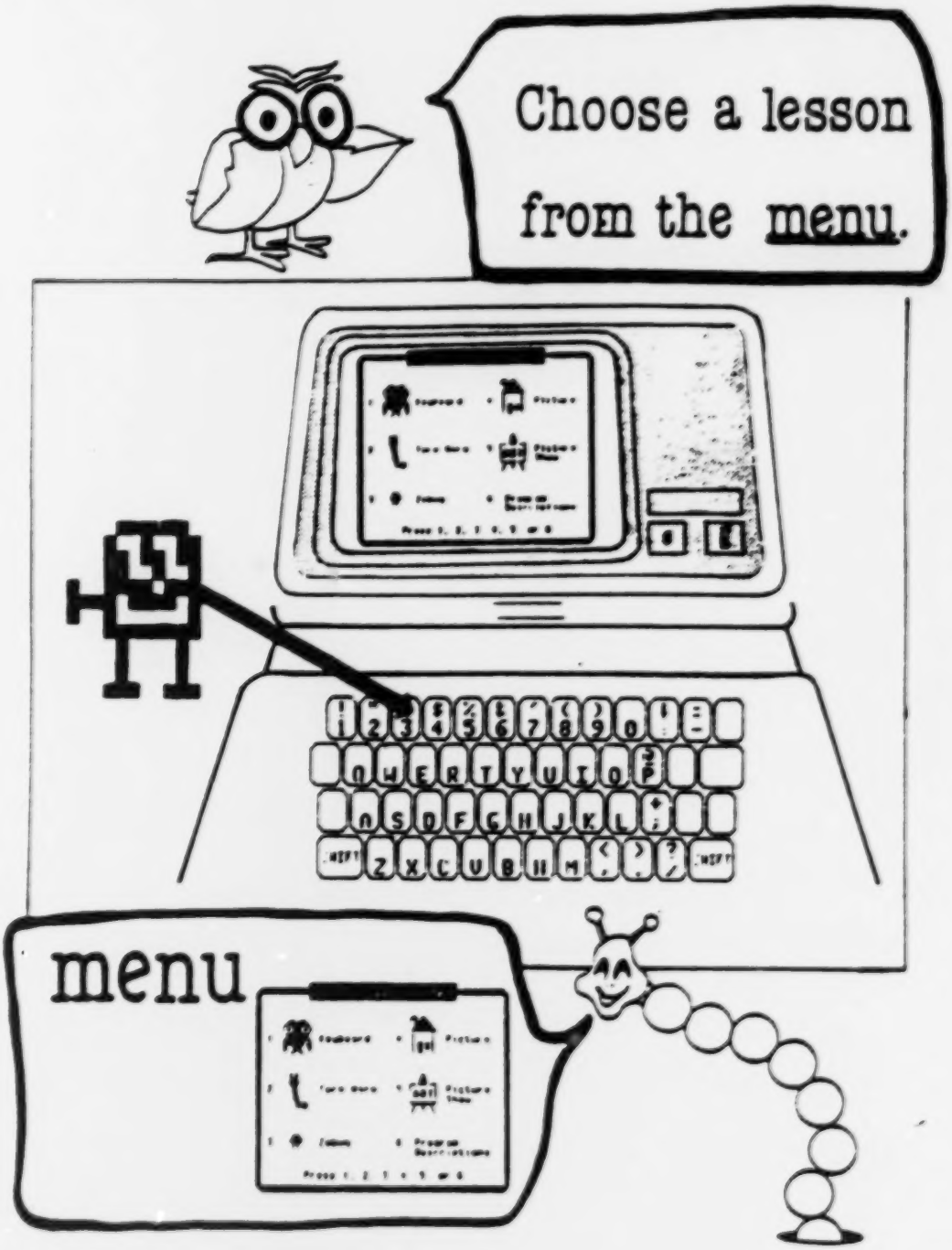
8. When the red light on the disk drive goes out, remove the disk from the disk drive and turn it over. Place it back in the disk drive with the label side up.



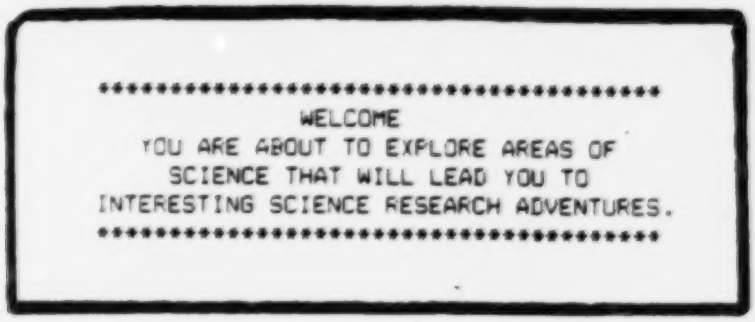
9. Type: LOAD GRAPHICS and press <RETURN>.

10. Type: RUN and press <RETURN>.

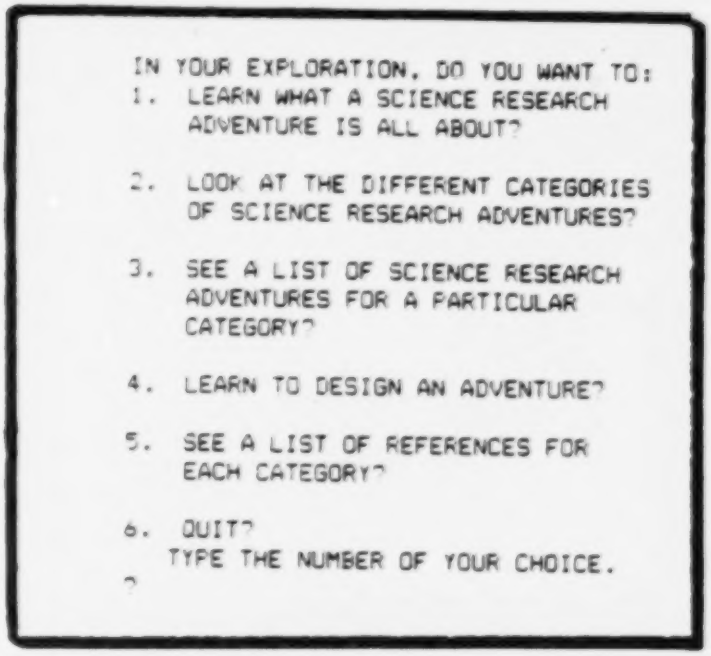
YOU WILL BE SHOWN A MENU. A MENU IN A COMPUTER PROGRAM IS A LIST OF OPTIONS. YOU MAKE CHOICES FROM IT JUST AS YOU WOULD FROM A RESTAURANT MENU.



THE FIRST SCREEN YOU WILL SEE WILL LOOK LIKE THIS:



THE FIRST MENU YOU WILL SEE IS THIS ONE:


IN YOUR EXPLORATION, DO YOU WANT TO:
1. LEARN WHAT A SCIENCE RESEARCH ADVENTURE IS ALL ABOUT?
2. LOOK AT THE DIFFERENT CATEGORIES OF SCIENCE RESEARCH ADVENTURES?
3. SEE A LIST OF SCIENCE RESEARCH ADVENTURES FOR A PARTICULAR CATEGORY?
4. LEARN TO DESIGN AN ADVENTURE?
5. SEE A LIST OF REFERENCES FOR EACH CATEGORY?
6. QUIT?
TYPE THE NUMBER OF YOUR CHOICE.
?

WHEN YOU CHOOSE <1> FROM THE ABOVE MENU, THE PROGRAM WILL SHOW YOU WHAT A SCIENCE RESEARCH ADVENTURE IS ALL ABOUT. THIS IS THE MAIN MENU AND YOU WILL KEEP RETURNING TO IT THROUGHOUT THE PROGRAM.

ONCE YOU CHOOSE THE AREA YOU WANT TO EXPLORE, YOU WILL COME TO A MENU OF SUB-HEADINGS.

BELOW ARE TWO MENUS WITH SUB-HEADINGS FOR YOU TO CHOOSE FROM:

```
SELECT THE CATEGORY YOU WOULD LIKE TO
SEE POSSIBLE SCIENCE RESEARCH
ADVENTURES FOR:


1.  BEHAVIORAL & SOCIAL SCIENCES
2.  BIOCHEMISTRY
3.  BOTANY
4.  CHEMISTRY
5.  COMPUTER SCIENCE
6.  EARTH & SPACE SCIENCES
7.  ENGINEERING
8.  ENVIRONMENTAL SCIENCES
9.  MATHEMATICS
10. MEDICINE & HEALTH
11. MICROBIOLOGY
12. PHYSICS
13. ZOOLOGY
14. RETURN TO MAIN MENU
TYPE THE NUMBER OF YOUR CHOICE.
?
```

```
SELECT THE CATEGORY YOU WOULD LIKE TO
SEE REFERENCES FOR:

1.  ANIMALS
2.  BEHAVIOR
3.  CHEMISTRY
4.  COMPUTERS
5.  ELECTRICITY
6.  ENERGY
7.  ENVIRONMENT
8.  HEAT
9.  INSECTS
10. LIGHT
11. MAGNETISM
12. MICROBIOLOGY
13. PLANTS
14. SOUND
15. WATER
16. WEATHER
17. RETURN TO MAIN MENU
TYPE THE NUMBER OF YOUR CHOICE.
?
```

TO END YOUR ADVENTURE. YOU CAN:

1a. Choose <QUIT> or <END> when given that choice on the menu.

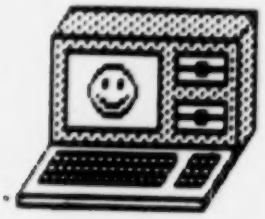
OR

b. When given the command "PRESS THE <RETURN> KEY TO CONTINUE", you may type the word <QUIT> and press <RETURN>. This will take you back to the main menu and then you can choose <QUIT> or <END>.

2. Once you have decided to end, wait until the disk drive light is off.

3. Remove your disk from the disk drive.

4. Switch off the monitor and the computer.



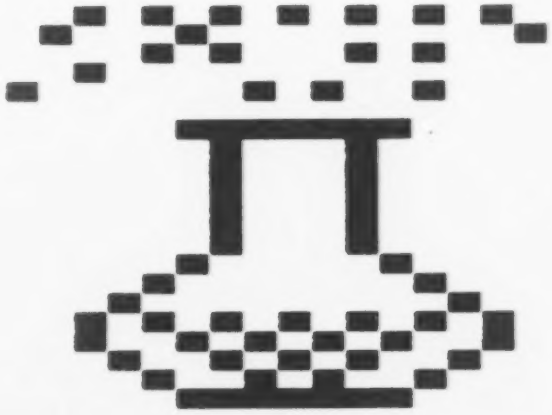
APPENDIX E

A SCIENCE RESEARCH ADVENTURE TEACHER GUIDE

APPENDIX E

A SCIENCE RESEARCH ADVENTURE

TEACHER GUIDE



SUZANNE M. PRINCE
NOVA UNIVERSITY

APRIL-MAY 1989

Starting Directions

In order to use this software, you must have the following equipment and software:

1. Apple IIe Computer with 48K of memory.
2. One disk drive.
3. TV monitor. It is not necessary to have a color monitor since the graphics are in black and white only.
4. Science Research Adventure software (with ProDOS System on the back side of disk and SRA on front).

If you are not familiar with the above equipment or software, see the Owners Guide for directions.

Purpose of the Science Research Adventure

Many science programs require that a science fair project be completed by students. Students enter middle school science classes with a wide variety of experiences that often did not include participation in a science fair or the completion of science research projects. The purpose of this software is to help students develop a better understanding of what science research projects involve and to offer a variety of project ideas in the different categories.

Objectives of the Science Research Adventure Software

1. Provide students with a wide range of science research topics in life, physical, earth, and computer sciences.
2. Identify for students references enabling them to search the literature in the area of their chosen topics.
3. Review for students the format for designing an experiment and offering specific examples in the different categories of science.

A List of References For Each Category

Several lists of reference words have been created to help the student research the chosen adventure. To see these lists, the student must choose #5 on the main menu. These reference word lists can be found in this Teacher's Guide. These can be duplicated so that the student may have the list available in the library.

Completion Time For The Various Sections of The Software

The software is designed for the student to make decisions about what areas of the software to explore. Very few students would choose to examine the entire program. If they did, completion time could be as long as 72 minutes.

The following times are estimates. Some students would take longer to read the material presented while others might skim it if they are already familiar with the concepts. Below is a time estimate for each section of the main menu:

Time/Minutes	Section
4:00	1. LEARN WHAT A SCIENCE RESEARCH ADVENTURE IS ALL ABOUT
11:00	2. LOOK AT THE DIFFERENT CATEGORIES OF SCIENCE RESEARCH ADVENTURES
46:00	3. SEE A LIST OF SCIENCE RESEARCH ADVENTURES FOR A PARTICULAR CATEGORY
7:00	4. LEARN TO DESIGN AN ADVENTURE
5:00	5. SEE A LIST OF REFERENCES FOR EACH CATEGORY

REFERENCE WORD LIST 1

ANIMALS

ADAPTATION
CARNIVORE
DIET
DOMESTICATION
ECOLOGY
EXTINCT
FAUNA
FOSSIL
HERBIVORE
HIBERNATION
HYBRID
INSTINCT
INVERTEBRATE
MAMMAL
METAMORPHOSIS
MIGRATION
SKELETON
VERTEBRATE
ZOOLOGY

BEHAVIOR

CREATIVITY
EMOTION
ESP
INSTINCTS
INTELLIGENCE
LEARNING
MEMORY
MOTIVATION
OPTICAL ILLUSION
PARAPSYCHOLOGY
PERCEPTION
PERSONALITY
POLLS
PSYCHOLOGY
RIGHT/LEFT BRAIN
SENSATION
SOCIOLOGY
STRESS
SURVEY
TELEPATHY

CHEMISTRY

ACID
ACID RAIN
ALKALINITY
BASE
BORIC ACID
CARBONIC ACID
CHEMISTRY
COMPOUND
ELEMENT
ENZYMES
FAT
HORMONE
HYDROCHLORIC ACID
HYDROGEN
HYDROXIDE
INDICATOR
LITMUS
NEUTRALIZATION
pH
PROTEIN
SALTS
STARCH
SOIL
SUGAR/GLUCOSE
SULFURIC ACID
TITRATION
VITAMINS

COMPUTERS 66

ARTIFICIAL INTELLIGENCE
BASIC
BINARY CODE/SYSTEM
BITS
BYTES
CATHODE RAY TUBE
CPU
CHIP
DATA PROCESSING
DISKS
FLOW CHARTS
HARDWARE
LANGUAGES
PROGRAMMING
RAM
ROM
SOFTWARE

ELECTRICITY

ALTERNATING CURRENT
ATOM
BATTERY
CIRCUIT
CIRCUIT BREAKER
DIRECT CURRENT
DRY CELL
ELECTRIC CHARGE
ELECTRIC GENERATOR
ELECTRODE
ELECTROLYSIS
ELECTROLYTE
ELECTROMAGNET
ELECTRON
ENERGY
FUSE
LIGHT
LIGHT BULB
OHM
PARALLEL CIRCUIT
PHOTOELECTRICITY
PHOTOVOLTAICS
RESISTANCE
SERIES CIRCUIT
SOLAR ENERGY
STATIC ELECTRICITY
SWITCH
VOLT
WATT
WET CELL

ENERGY

ATOM
CALORIE
CELSIUS
COAL
CONSERVATION
FAHRENHEIT
GEOTHERMAL
HEAT
HYDROELECTRIC
JOULE
KINETIC
NUCLEAR POWER
PETROLEUM
PHOTOVOLTAICS
POTENTIAL ENERGY
SOLAR ENERGY
TEMPERATURE
THERMOMETER

REFERENCE WORD LIST 2

ENVIRONMENT

AIR POLLUTION
CONSERVATION
ENDANGERED SPECIES
EROSION
IRRIGATION
INSECTICIDES
PESTICIDES
POLLUTION
WATER POLLUTION

HEAT

BOILING POINT
BTU
CELSIUS
CHEMICAL REACTION
COMBUSTION
CONDUCTION
CONVECTION
DECOMPOSITION
ENERGY
FAHRENHEIT
FRICTION
FUEL
INSULATION
JOULE
PHYSICAL CHANGE
RADIATION
SPECIFIC HEAT
TEMPERATURE
THERMODYNAMICS
THERMOGRAPHY

INSECTS

ANIMAL
ARTHROPOD
CHITIN
CLASSIFICATION
COCOON
COLD-BLOODED
COMPOUND EYE
ENTOMOLOGY
EXOSKELETON
GRUB
INSECTICIDE
INVERTEBRATE
LARVA
METAMORPHOSIS
MIGRATION
MIMICRY
MOLTING
NYMPH
PARASITE
PESTICIDE
PHEROME
POLLINATION
PREDATOR
PUPA
SPIRACLES

LIGHT

BULB
COLOR
DIFFRACTION
EDISON
E.RADIATION
E.WAVES
FLUORESCENT
INCADESCENT
INFRARED
LASER
LED
LIGHT METER
LIGHT YEAR
LUMINOUS
OPAQUE
OPTICS
PENUMBRA
PHOTOELECTRIC
PHOTON
POLARIZED LIGHT
PRISM
RAINBOW
RAY
REFLECTION
REFRACTION
SPECTROMETER
TRANSVERSE WAVE
WAVE THEORY

MAGNETISM

ALNICO
ATOMS
CERAMIC MAGNET
DIPPING NEEDLE
ELECTRICITY
ELECTROMAGNETISM
ELECTRIC GENERATOR
ELECTRIC MOTOR
FERRITES
FORCE FIELDS
GAUSS
LOADSTONE
MAGNET
M.COMPASS
M.EQUATOR
M.FIELD
M.POLE
M.TAPE
PERMANENT MAGNET
SEMICONDUCTORS

MICROBIOLOGY

BACTERIA
BLACK MOLD
BLUE MOLD
COMPOST
DECOMPOSITION
FUNGI
HYPHAE
MILDEW
MOLD
MUSHROOM
MYCELIUM
PENICILLIN
PROTISTS
PROTOZOA
RHIZOIDS
RUST
SLIME MOLD
SPORE
VIRUS
YEAST

REFERENCE WORD LIST 3

PLANTS

ALGAE
ANNUALS
BIENNIALS
BOTANY
BULBS
CARBON DIOXIDE
CELL STRUCTURE
CELLULOSE
CHLOROPHYLL
COMPOST
DICOTYLEDONS
ECOLOGY
FERNS
FERTILIZER
FLORA
FLORICULTURE
FLOWER
FRUIT
HORTICULTURE
HYDROPONICS
INSECTIVOROUS
LEAF
MONOCOTYLEDONS
MOSS
MUSHROOMS
OSMOSIS
PHLOEM
POLLEN
POLLINATION
PHOTOSYNTHESIS
PROPAGATION
SEED
SOIL
STEM
SYMBIOSIS
TRANSPIRATION

WATER

ARTESIAN
AQUIFER
BOILING POINT
BRAKISH
CAPILLARITY
CONDENSATION
CONSERVATION
DEHYDRATION
DESALINATION
DISTILLATION
ENVIRONMENT
EVAPORATION
FILTRATION
FREEZING POINT
GROUND WATER
HARD WATER
HYDROLOGY
HYDROLYSIS
IRRIGATION
POLLUTION
PRECIPITATION
PURIFICATION
SALT WATER
SANITATION
SOFT WATER
SURFACE TENSION
WATER CYCLE
WATER TABLE
WATER TRANSPORT

SOUND

ACOUSTICS
AMPLITUDE
DECIBEL
ECHO
FREQUENCY
HEARING
HERTZ
PITCH
RESONANCE
REVERBERATION
SONAR
SOUND BARRIER
ULTRASOUND
VELOCITY
VIBRATION

WEATHER

AIR MASS
ATMOSPHERE
BAROMETER
CLIMATE
CONDENSATION
EVAPORATION
HYGROMETER
FORECASTING
FRONTS
JET STREAM
METEOROLOGY
PRECIPITATION
PSYCHROMETER
RELATIVE HUMIDITY
TEMPERATURE
WATER CYCLE

APPENDIX F

PERMISSION LETTER TO PARENTS

APPENDIX F

PERMISSION LETTER TO PARENTS

Date

Dear Parents:

I am currently finishing a master's degree in computer education and science. For a culminating activity, I am investigating the effects that microcomputers have on participation and achievement in science research projects. I have selected your child to participate in a study that will be implemented for four weeks. This study will begin April 24,1989, and end May 19, 1989. The study will require that your child use the microcomputer as a tool in completing a research project. Your child will not have to do any extra studying for this project and all activities will be done during class time. All results will be confidential and no individual's name will be used in my final report. If you do not wish your child to participate in the study, please notify me in writing no later than April 18, 1989. If you have any questions concerning this study, please feel free to contact me at 334-1357, Monday through Friday, between 8:10 A.M. and 3:45 P.M.

Sincerely,

Mrs. Suzanne M. Prince
6th Grade Science

APPENDIX G

A SURVEY OF STUDENT ATTITUDES TOWARD CAI

APPENDIX G

A SURVEY OF STUDENT ATTITUDES TOWARD CAI

Please answer each question as honestly as possible. Circle (a) agree if the statement describes how you feel. Circle (b) disagree if the statement does not describe how you feel. Circle (c) not sure if you really don't know if the statement is true about you. This will not receive a grade. You don't have to put your name on this survey.

1. I do my best work when using a computer.

   (a) agree (b) disagree (c) not sure

2. I feel no one really cares if I learn when I'm using a computer.

   (a) agree (b) disagree (c) not sure

3. Using a computer gets boring after a while.

   (a) agree (b) disagree (c) not sure

4. The computer programs give too much material to learn and not enough time.

   (a) agree (b) disagree (c) not sure

5. I get more involved in running the computer than learning the material.

   (a) agree (b) disagree (c) not sure

6. I like the way you can work at your own speed with the computer.

   (a) agree (b) disagree (c) not sure

7. I feel nervous when I use computers.

   (a) agree (b) disagree (c) not sure

8. I enjoy computers and learn better when I use them.

(a) agree (b) disagree (c) not sure

9. I would rather use a textbook instead of a computer for instruction.

(a) agree (b) disagree (c) not sure

10. I would rather use a computer for instruction instead of a textbook.

(a) agree (b) disagree (c) not sure

11. I am satisfied with what I learn on the computer.

(a) agree (b) disagree (c) not sure

12. The reading level of the material presented on a computer is equal to my reading ability.

(a) agree (b) disagree (c) not sure

APPENDIX H

PROGRESS LETTER TO PARENTS

APPENDIX H

PROGRESS LETTER TO PARENTS

May ___ ,1989

To The Parent of_____:

Your child is involved in a study that uses the microcomputer as a tool in completing a science research project. The project began on April 24, 1989, and will end around May 19,1989.

One of the objectives of this project is to keep the parents informed about the progress of their child. The following checklist indicates the steps involved in completing the research project. A checkmark indicates that your child has completed that step.

_____ Selection of Topic (due May 1)
_____ Hypothesis/Statement of Purpose (due May 5)
_____ Materials List (due May 5)
_____ Procedures List (due May 5)
_____ Library Research (due May 12)
_____ Experimentation (due May 19)
_____ Data/Observations/Graphs (due May 19)
_____ Conclusions (due May 19)
_____ Final Report (due May 26)

If you have any questions, please do not hesitate to call the school at 334-1357 from 8:10-9:15 A.M.

Sincerely,

Mrs. Suzanne M. Prince
6th Grade Science

APPENDIX I

SUMMARY RESULTS TO A SURVEY OF STUDENT ATTITUDES TOWARD CAI BEFORE STARTING THE SCIENCE RESEARCH ADVENTURE

APPENDIX I

SUMMARY RESULTS TO A SURVEY OF STUDENT ATTITUDES TOWARD CAI BEFORE STARTING THE SCIENCE RESEARCH ADVENTURE

The results are given in percentages.

	(A)	(B)	(C)
1.	72	8	20
2.	20	44	36
3.	32	48	20
4.	28	48	24
5.	36	52	12
6.	80	4	16
7.	4	88	8
8.	56	8	36
9.	8	88	4
10.	78	11	11
11.	83	11	6
12.	33	11	56

APPENDIX J

SUMMARY RESULTS TO A SURVEY OF STUDENT ATTITUDES TOWARD CAI AFTER COMPLETING THE SCIENCE RESEARCH ADVENTURE

APPENDIX J

SUMMARY RESULTS TO A SURVEY OF STUDENT ATTITUDES TOWARD CAI AFTER COMPLETING THE SCIENCE RESEARCH ADVENTURE

The results are given in percentages.

	(A)	(B)	(C)
1.	74	4	22
2.	13	48	39
3.	26	48	26
4.	39	35	26
5.	35	30	35
6.	78	13	9
7.	0	83	17
8.	70	8	22
9.	0	91	9
10.	83	4	13
11.	78	17	4
12.	48	26	26